CLAIMS

1. A method of measuring a power spectrum of an optical signal, comprising:

transmitting the optical signal through an optical fiber;

coupling a power of at least one wavelength of the optical signal from a first mode to a second mode of the waveguide; and

measuring the power of the optical signal coupled from the first mode to the second mode at a detector.

2. The method of claim 1, wherein a mode coupler is provided to couple the power of the at least one wavelength.

3. The method of claim 2, wherein the mode coupler is selected from an acoustic grating, a UV grating, a bending grating and a stress induced grating.

4. The method of claim 2, wherein the mode coupler includes an acoustic wave generator and an acoustic wave propagation member coupled to the optical fiber.

5. The method of claim 1, further comprising:

removing that portion of the at least one wavelength that is not coupled from the first mode to the second mode

6. The method of claim 4, wherein the wavelength of the optical signal coupled from the first mode to the second mode is changed by varying a frequency of an acoustic wave produced by a mode coupler coupled to the optical fiber.

7. The method of claim 1, wherein the mode coupler produces multiple acoustic signals with individual controllable strengths and

frequencies and each of the signals provides a coupling between one mode to a different mode.

8. The method of claim 1, wherein an amount of the optical signal coupled from the first mode to the second mode is changed by varying an amplitude of a signal applied to the mode coupler.

9. The method of claim 1, wherein at least one core mode is converted to a different core mode.

10. The method of claim 1, wherein at least one core more is converted to a cladding mode.

11. The method of claim 1, wherein at least one cladding mode is converted to a core mode.

12. The method of claim 1, wherein at least one cladding mode is converted to a different cladding mode.

13. The method of claim 1, wherein the wavelength coupled from the first mode to the second mode is changed by varying a frequency of an acoustic wave produced by the mode coupler.

14. The method of claim 1, wherein a mode converter is provided to produce multiple acoustic signals with individual controllable strengths and frequencies and each of an acoustic signals provides a coupling between one mode to a different mode.

15. The method of claim 1, wherein a mode coupler is coupled to the optical fiber and configured to provide at least one perturbation in the optical fiber to create a coherent coupling between a first mode to a second mode in the optical fiber.

16. The method of claim 1, further comprising:

changing the polarization of the optical signal prior to coupling the light.

17. The method of claim 1, wherein the first and second modes have different polarization states in the optical fiber.

18. The method of claim 1, further comprising:

detecting a power spectrum of a band of wavelengths that have been coupled.

19. The method of claim 1, further comprising:

detecting a power spectrum of coupled second mode wavelengths.

20. The method of claim 1, further comprising:

adjusting a strength of a signal that provides coupling between the first and second modes.

21. The method of claim 1, further comprising:

scanning through a range of signals that provide coupling between the first and second modes.

22. The method of claim 1, further comprising:

adjusting a strength of a signal that provides coupling between the first and second mode to maximize coupling between the first and second modes.

23. The method of claim 1, further comprising:

dithering a strength of a signal that provides coupling between the first and second mode to maximize coupling between the first and second modes.

24. A method of monitoring a power spectrum of an optical signal, comprising:

changing polarizations of the optical signal in a polarization scrambler;

coupling a first mode of the optical signal to a second mode at a mode converter;

detecting the second mode at a detector;

generating a signal responsive to detection of the second mode;

averaging the signal to measure a power of the second mode, wherein measurement of the power of the second mode is polarization independent.

25. The method of claim 24, wherein a wavelength of the optical signal coupled from the first mode to the second mode is changed by varying a frequency of an acoustic signal applied to the mode coupler.

26. The method of claim 24, wherein the mode coupler produces multiple acoustic signals with individual controllable strengths and frequencies and each of the acoustic signals provides a coupling between one mode to a different mode.

27. The method of claim 24, wherein an amount of the optical signal coupled from the first mode to the second mode is changed by varying an amplitude of an acoustic signal applied to the mode coupler.

28. The method of claim 24, wherein at least one core mode is coupled to a different core mode.

29. The method of claim 24, wherein at least one core mode is coupled to a cladding mode.

30. The method of claim 24, wherein at least one cladding mode is coupled to a core mode.

31. The method of claim 24, wherein at least one cladding mode is coupled to a different cladding mode.

32. The method of claim 24, wherein a wavelength coupled from the first mode to the second mode is changed by varying the frequency of an acoustic signal applied to the mode coupler.

33. The method of claim 24, wherein the mode converter produces multiple acoustic signals with individual controllable strengths and frequencies and each of the acoustic signals provides a coupling between one mode to a different mode.

34. The method of claim 24, wherein the mode converter provides at least one perturbation in the optical fiber to create a coherent coupling between the first mode to the second mode in the optical fiber.

35. A spectral monitor, comprising:

an optical fiber with multiple modes;

a mode coupler coupled to the optical fiber, the mode coupler provides at least one perturbation in the optical fiber to create a coherent coupling between the first mode to the second mode in the optical fiber;

a detector positioned to detect a coupling power spectrum of the coupling from the first mode to the second mode; and

a feedback control coupled to the mode coupler and the detector to control the power of the coupling power.

36. The apparatus of claim 35, wherein the mode coupler is selected from an acoustic grating, a UV grating, a bending grating and a stress induced grating.

37. The apparatus of claim 35, wherein the mode coupler includes an acoustic wave generator and an acoustic wave propagation member coupled to the optical fiber.

38. The monitor of claim 35, further comprising:

a polarization scrambler coupled to the optical fiber and the mode coupler.

39. The monitor of claim 35, further comprising:

a modal filter coupled to the mode coupler and the detector.

40. A spectral monitor, comprising:

an optical fiber with multiple modes;

a mode coupler coupled to the optical fiber and configured to provide at least one perturbation in the optical fiber to create a coherent coupling between a first mode to a second mode in the optical fiber; and

a core-blocking membercoupled to the optical fiber, the core blocking member configured to substantially block those portions of the first mode that are not coupled to the second mode.

41. The monitor of claim 40, wherein thecoreblocking member includes a reflective material positioned over a core region of a distal end of the optical fiber.

42. The monitor of claim 40, wherein the mode coupler is selected from an acoustic grating, a UV grating, a bending grating and a stress induced grating.

43. The monitor of claim 40, wherein the mode coupler includes an acoustic wave generator and an acoustic wave propagation member coupled to the optical fiber.

44. The monitor of claim 40, further comprising:

a polarization scrambler coupled to the optical fiber and the mode coupler.

45. A polarization independent spectral monitor, comprising:

an optical fiber with multiple modes;

a first mode coupler coupled to the optical fiber, the first mode coupler producing a first acoustic wave in the optical fiber to couple a first mode of an optical signal to a second mode in the optical fiber; and

a second mode coupler coupled to the optical fiber, the second mode coupler producing a second acoustic wave in the optical fiber that is orthogonal to the first acoustic wave.

46. The monitor of claim 41, wherein each mode coupler includes an acoustic wave generator and an acoustic wave propagation member coupled to the optical fiber.

47. The monitor of claim 41, further comprising:

a modal filter coupled to the second mode coupler and the optical fiber; and

a detector coupled to the modal filter.

48. A polarization independent spectral monitor, comprising:

an optical fiber with multiple modes; and

a mode coupler coupled to the optical fiber and configured to produce independent orthogonal acoustic waves in the optical fiber that couple a first mode to a second mode; and

a detector positioned to detect a coupling power spectrum of the coupling from the first mode to the second mode.

49. The spectral monitor of claim 48, wherein the mode coupler includes, a first pair and a second pair of electrodes, the first and second pairs producing the horizontal and vertical independent acoustic waves in response to application of first and second voltages to each pair of electrodes.

50. The monitor of claim 48, further comprising:

a modal filter coupled to the mode coupler and the optical fiber; and

a detector coupled to the modal filter.